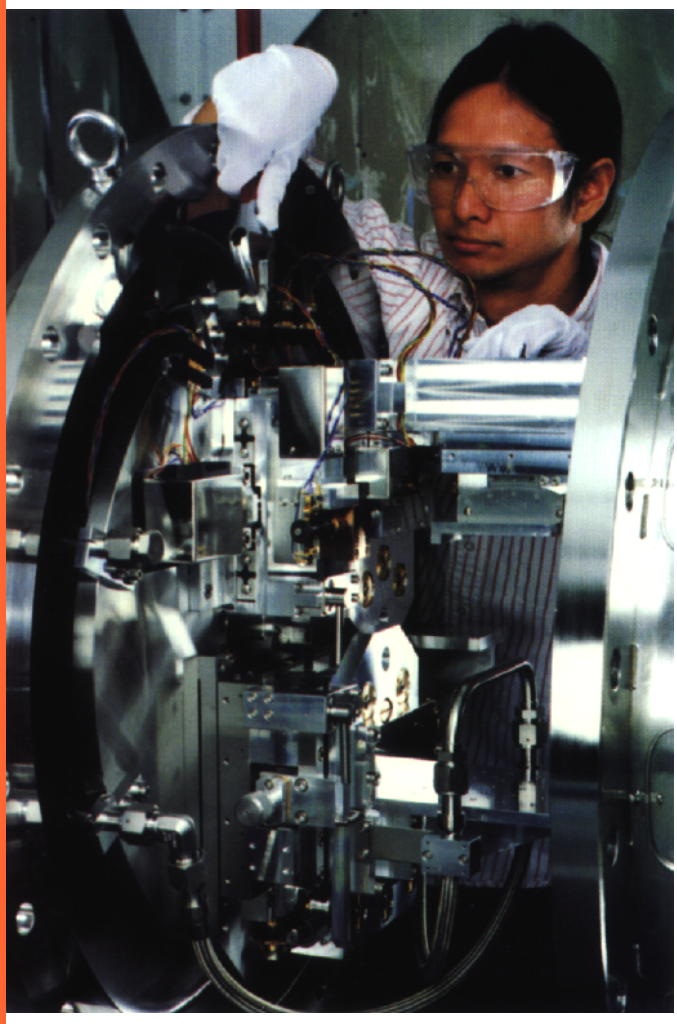
APS



Perfect silicon crystals used to monochromatize beams of X-rays generated by the Advanced Photon Source are mounted in these vacuum and mechanical housings. Monochromators are often used at synchrotron light sources as the first optical components to select the energy of the radiation for an experiment. At the APS, these crystals will be subjected to unprecedentedly high heat loads.

The Advanced Photon Source (APS) at Argonne National Laboratory is a powerful synchrotron X-ray research facility. APS is the source of this nation's most brilliant synchrotron radiation X-ray beams in the energy range from 3 to 300 kilo-electron-volts -the so-called "hard X-ray" portion of the spectrum.

APS design is optimized for special magnet arrays called "insertion devices" which generate highly tunable photon beams. These brilliant X-ray beams probe material structure in greater detail than ever before, opening new vistas of research in materials science, chemistry, physics, biotechnology, medicine, and the environmental, geological, agricultural, and planetary sciences.

Researchers can look at objects thousands of times smaller than can be seen with conventional optical techniques. Exposure times are billionths of a second, fast enough to image chemical and biological molecules as they react, and to make "movies" of catalytic and enzyme reactions.

APS research enhances America's competitiveness in such areas as superconductors, semiconductors, polymers, pharmaceuticals, and catalysts. X-ray optical systems and fast detectors being developed for APS greatly speed the analysis of materials, such as large biological molecules, that deteriorate under prolonged X-ray exposure.

The tremendous brilliance of APS X-ray beams reveals the precise positions of atoms as new materials are formed, and the mechanisms by which atomic changes at these positions give materials new and unusual properties. This knowledge helps create new materials with properties tailored to specific applications. In addition, APS provides a wealth of information about the magnetic and electronic structures of new materials.

APS accelerates positrons to energies of seven billion electron-volts (7 GeV) and stores them in a circular path about two-thirds of a mile in circumference. Insertion devices vibrate the positron beam, causing it to emit an intense, laser-like beam of X-rays. These beams can be tuned to energies up to 40 keV for the highly monochromatic X-rays from undulators and up to 300 keV for the intense, "white-light" X-rays from wigglers.

ADVANCED PHOTON SOURCE

Up to 70 beam lines will allow 400 researchers to perform experiments at the same time.

INDUSTRIAL USERS

The Advanced Photon Source stimulates rapid advances in American industrial research. Here are some industries that do or can use the APS for research and development.

- Aerospace
- Agriculture
- Biotechnology
- Ceramic and composite materials
- Chemicals
- Communication
- Computers
- Energy storage
- Environmental technology
- Geology
- Magnetics
- Metal alloys
- Medical imaging
- Microelectronics
- Nuclear energy
- Oil products
- Pharmaceuticals
- Semiconductor materials
- Synthetic fibers
- Transportation
- Waste management

The Advanced Photon Source opens new realms of research in the structure of materials. Researchers will be able to perform more experiments in less time and gather better data than ever before. The resulting advances in materials and technologies help the nation enhance its lead in technology and science, and stimulate the development of new high-technology industries.

USER COMMUNICATIONS

The APS Users' Organization Steering Committee maintains two-way communication between APS management and customers to ensure that customer needs are met. Committee membership includes representatives of:

- Argonne National Laboratory
- Cornell University
- Dow Chemical Company
- DuPont Chemical Company
- Iowa State University
- Los Alamos National Laboratory
- Lucent Technologies
- McGill University
- National Institute of Standards & Technology
- Northwestern University
- Oak Ridge National Laboratory
- University of Chicago
- University of Michigan
- University of Washington